ON THE TERTIARY LIMESTONES AND FORAMINIFERAL TUFFS OF MALEKULA, NEW HEBRIDES.

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(Plates xxxvii.-xli.)

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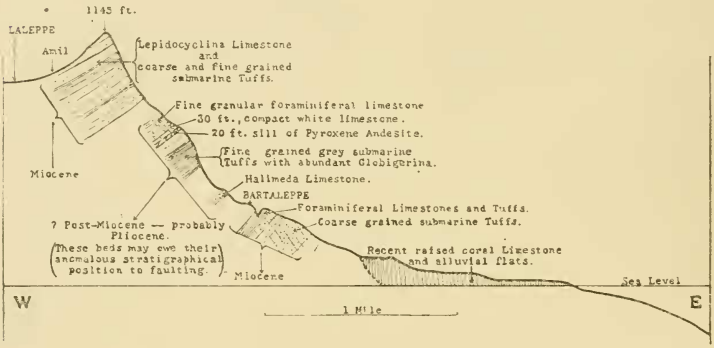
i. Introduction.

The series of rocks from Malekula now under discussion, form part of the extensive and valuable collection made by Mr. Douglas Mawson, B.Sc., B.E., in 1903. The present paper, in continuation of one I have already published,* and another con-

* "Notes on the Older Tertiary Foraminiferal Rocks on the West Coast of Santo, New Hebrides," Proc. Linn. Soc. N. S. Wales, 1905, Vol. xxx. pp.261-274, pls.v.-viii.

jointly with Mr. Mawson,* deals exclusively with the Miocene and the post-Miocene (probably Pliocene) rocks of the Island of Malekula, south of Santo; and although the specimens comprised in this part of the collection are not numerous, this is amply compensated for by their extremely interesting nature.

The following outline sketch, kindly drawn up by Mr. Mawson, illustrates the field-relations of the beds herein dealt with.



Compare with that appearing in "The Geology of the New Hebrides,"† in which the series above Bartaleppe, now regarded as probably Pliocene, is not differentiated from the Lepidocyclina series, and is regarded as Miocene.

ii. The Miocene Limestones and Tuffs.

Details of the specimens examined:—

No. 105.—"Limestone *in situ* at Amil, Laleppe (Lalemba) N. end of Malekula. At least 1000 ft. above sea-level"‡

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* "Halimeda Limestones of the New Hebrides," Quart. Journ. Geol. Soc. Vol. lxii. 1906, pp. 702-711, pls. xlix.-li.

† Proc. Linn. Soc. N. S. Wales, 1905, Vol. xxx. p. 417, fig. 2.

‡ Mawson, *op. cit.* p. 418.

This is a whitish or cream-coloured limestone, of fairly compact texture, and having the appearance of a hard coral-reef rock, with occasional fragments of decomposed volcanic rock (andesite) showing on the fractured surface.

Subjected to a microscopic examination, this rock is seen to consist of numerous tests of foraminifera, both large and small, the former being usually fragmentary, or showing signs of abrasion before being cemented into the rock. The matrix consists of a fine granular paste, and its earthy or chalky appearance in thin sections leads one to conclude that calcareous algæ, although no longer apparent in the rock, played an important part in its original constitution. Besides foraminifera, the following organic remains were seen :—*Lithothamnium* (*L. ramosissimum* Reuss sp.) and probably *Lithophyllum* (growing in a thin foliaceous manner and encrusting other organisms); numerous echinoid spines; also polyzoa.

The Foraminifera observed in this rock are :—

Orbulina universa D'Orb. Section showing the initial 'globigerine' series of chambers.

Truncatulina sp.

Carpenteria rhaphidodendron Moebius.

Pulvinulina cf. *repanda* F. & M. sp.

Gypsina globulus Reuss sp.

Miogypsina burdigalensis Gümbel sp.

Polytrema planum Carter. Growing in alternate layers with (?) *Lithophyllum*.

Amphistegina lessonii d'Orb. Very large specimens with numerous whorls, probably the microspheric form of the species.

Operculina sp. In fragments only.

Lepidocyclina angularis Newton & Holland.

L. andrewsiana Jones & Chapman.

L. verbeeki Newton & Holland.

Nos.106A and 106B.—"Fragments of rock *in situ* (limestones and tuffs), at creek just before Bartaleppe (about 400 ft. above sea-level), Malekula."*

No.106A is a whitish, granular, and somewhat friable limestone, rather tuffaceous, with embedded pellets of igneous rocks. In thin sections this limestone is seen to consist largely of foraminiferal tests, but branching *Lithothamnium*, echinoid fragments, and lamellibranch shells are also present.

The Foraminifera are:—
Globigerina conglobata Brady.
Truncatulina sp.
Carpenteria rhaphidodendron Moebius sp.
Rotalia sp.
Amphistegina lessonii d'Orb.; large tests as in No.105.
Operculina sp.
Linderina cf. *brugesi* Schlumberger.
Lepidocyclina (?) *verbeeki* Newton & Holland.
L. (?) *sumatrensis* Brady.

No.106B.—An ash-coloured, fine-grained, friable tuff, containing a large number of *Globigerina* tests, referable to *G. bulloides* d'Orb., and *G. conglobata* Brady.

No.108.—"From the Laleppe Amil to Bartaleppe track, about 1 mile from the amil, and at an elevation approximating 1000 ft."* A compact yellowish limestone. The matrix of the rock is fine-grained, with a crystalline cement. Distributed throughout are large foraminiferal tests, chiefly of *Lepidocyclina*, *Operculina*, and *Miogypsina*. Associated with these organisms are fragments of the characteristic *Lithothamnium ramosissimum* and echinoid plates and spines. The Foraminifera in this rock are of especial interest, as the following list will show:—

Spiroloculina cf. *limbata* d'Orb.
Miliolina cf. *trigonula* Lam. sp.

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* Mawson, *op. cit.* p.418.

Miliolina cf. *tricarinata* d'Orb. sp.

Sigmoïlina sp.

Trillina howchini Schlumberger; very common. (Pl. xxxix., figs.7-9).

Alveolina cucumoides, sp.nov.; very common. (Pl. xxxviii., figs.5, 6).

Truncatulina sp.

Carpenteria sp.

Gypsina globulus Reuss sp.

Miogypsina complanata Schlumberger; frequent.

Operculina complanata Defr.; very common. (Pl. xxxvii., figs.1, 2; Pl.xxxviii., fig.3).

Lepidocyclina cf. *andrewsiana*, Jones & Chapman; rare.

L. angularis Newton & Holland; common. (Pl.xxxvii., fig.2; Pl. xxxviii., fig.4).

L. verbeeki Newton & Holland; frequent.

L. munieri Lemoine & R. Douvillé; very rare. (Pl.xxxvii., fig.2).

iii. Limestones and Tuffs of (?) Post-Miocene Age.

Details of specimens :—

No.87.—"Limestone several hundred feet above sea-level, Port Stanley, Malekula."†

General characters: a hard cream-coloured limestone, with whitish streaks and patches, due to partially decomposed organic structures, in consequence of which the rock is rendered powdery and cavernous, and difficult to preserve whole in thin sections.

Microscopical characters: a study of this rock under the microscope shows it to be largely of foraminiferal origin, possibly more than 50% of the rock consisting of their tests. This example is rather of the nature of a reef-rock than a consolidated beach sand, and it is also distinctly brecciated. The larger organisms, as for example the reef-forming foraminiferon, *Polytrema planum*, are frequently broken, the latter being

† Mawson, *op. cit.* p.416.

often faulted across its plane of growth or attachment-surface, as if the onslaught of talus-blocks had disturbed a half consolidated reef-accumulation, shattering the thin cake-like organic overgrowths. The ground-mass of the rock consists of a fine, crystalline, calcitic mud. Amongst the amorphous-looking brecciated fragments there appear to be traces of coral structure.

The Foraminifera seen in this limestone in the order of their abundance are :—

Polytrema planum Carter. One specimen measures about 10 mm. in length. (Pl. xl., fig. 11).

Amphistegina lessonii d'Orb.

Heterostegina depressa d'Orb. Examples with a thick central disc.

Carpenteria sp.

Rotalia sp.

Truncatulina sp.

? *Textularia.*

The other organic remains present in this rock are polyzoa, echinoid spines and a thin, encrusting (?) calcareous alga.

No. 88.—"Limestone from hill above Port Stanley, near sea-level."

General characters : a cream-coloured brecciated limestone, in all probability originally entirely organic, but subsequently suffering a certain amount of decomposition and disintegration, resulting in its present granular structure. The chief organic constituents are calcareous algæ, represented by the branching *Lithothamnium, L. ramosissimum,* and molluscan shells, chiefly gasteropods, and a plate of an echinid test.

The only Foraminifera noticed are :—

Miliolina bosciana d'Orb. sp.

? *Verneuilina pygmæa* Egger.

? *Carpenteria.*

Gypsina ? *globulus* Reuss sp.

Amphistegina lessonii d'Orb.

(?) Pliocene or subrecent in age.

No.91.—"Chips from seats in Amil, Pinalum Point, on E. Coast, Malekula (not *in situ*)."*

91A.—Macroscopic characters: a hard, yellowish, gritty-looking limestone of fine-grained texture.

Microscopic details: in thin sections this is seen to be an impure limestone of organic origin, containing abundant foraminifera, a few fragments of a slender, branching *Lithothamnium*, some polyzoa, and lamellibranch shells, together with a fair amount of angular quartz and a few scattered particles of hornblende and a chloritic mineral. A coarsely crystalline calcitic cement surrounds the rock-constituents, and the whole texture is granular. The Foraminifera are excellently preserved, and include—

Globigerina bulloides d'Orb.; rare.
G. conglobata Brady, common.
? *Pullenia obliquiloculata* P. & J.; frequent.
Sphæroidina dehiscens P. & J.; frequent. (Pl. xli., fig.14).
Truncatulina cf. *ungeriana* d'Orb. sp.
Pulvinulina ? *repanda* F. & M. sp.; rare.
Amphistegina lessonii d'Orb.; common.
Heterostegina sp.

91B.—Macroscopic characters: a compact yellow to ash-coloured limestone, containing numerous lighter-coloured streaks and patches, chiefly the remains of calcareous plants.

Microscopic contents: under the microscope this rock is seen to consist largely of the sea-weed *Halimeda*. Foraminifera, echinoid fragments, and polyzoa are also present, the whole being cemented by a clear crystalline deposit of calcite. The Foraminifera noticed are:—

Miliolina sp.
Sigmoïlina sp.
Orbitolites complanata Lamarck.

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* Mawson, *op. cit.* p.416, where they are classed as Miocene.

Orbitolites marginalis Lam. sp.
Textularia trochus d'Orb. (Pl. xli., fig.15).
Carpenteria sp.
Pulvinulina sp.
Heterostegina depressa d'Orb.

The age of these rocks is probably Pliocene or later. The foraminiferon *Sphæroidina dehiscens*, which occurs in 91A with frequency, has not been found in strata below the Pliocene (*fide* H. B. Brady).

No.102.—"Outcrops at Laleppe, about 900 ft. above sea-level, Malekula."*

This is a rather gritty, pale ash-coloured limestone, principally organic, but with an admixture of volcanic products, chiefly glassy. Besides foraminifera, spines of echinoids were noticed in thin slices of this rock.

The Foraminifera are :—
Biloculina cf. *ringens* Lam.
Orbulina universa d'Orb.; frequently showing the enclosed embryonic 'globigerine' stage of the test. (Pl.xli , fig.13).
Globigerina bulloides d'Orb.
G. conglobata Brady.
Carpenteria sp.; tests much crushed.
Pulvinulina cf. *repanda* F. & M. sp.
Amphistegina lessonii d'Orb.; specimens numerous but small. (Pl. xli., fig.13).
Heterostegina depressa d'Orb.; tests fragmentary, common.
Probably of Pliocene age.

No.107.—"Bedded sedimentary series on the Laleppe Amil to Bartaleppe track at an elevation of about 700 ft.; Malekula."*
Fine-grained, ash-coloured, foraminiferal tuffs.
Globigerina numerous. Specimens apparently all belonging to *G. bulloides* d'Orb.

* Mawson, *op. cit.* p.418.

iv. Distribution List of Foraminifera from Malekula.

NAME.	MIOCENE.				POST MIOCENE.					
	105	106A	106B	108	87	88	91A	91B	102	107
Biloculina cf. *ringens* Lam.									×	
Spiroculina cf. *limbata* d'Orb.				×						
Miliolina cf. *trigonula* Lam. sp.				×						
,, cf. *tricarinata* d'Orb. sp.				×						
,, sp.								×		
Sigmoïlina sp.				×				×		
Trillina howchini Schlumberger				×						
Orbitolites complanata Lam.								×		
,, *marginalis* Lam. sp.								×		
Alveolina cucumoides, sp. nov.				×						
Textularia trochus d'Orb.								×		
? *Textularia*					×					
? *Verneuilina pygmæa* Egger						×				
Orbulina universa d'Orb.	×								×	
Globigerina bulloides d'Orb.			×				×		×	×
,, *conglobata* Brady		×	×				×		×	
? *Pullenia obliquiloculata* P. & J.							×			
Sphæroidina dehiscens P. & J.							×			
Truncatulina cf *ungeriana* d'Orb. sp.							×			
,, sp.	×	×		×	×					
Carpenteria rhaphidodendron Moeb	×	×								
,, sp.				×	×	? ×		×	×	
Gypsina globulus Reuss sp.	×			×		? ×				
Miogypsina burdigalensis Gümbel sp	×									
,, *complanata* Schlumberger				×						
Polytrema planum Carter	×				×					
Pulvinulina cf. *repanda* F. & M. sp	×						×		×	
,, sp.								×		
Rotalia sp.		×			×					
Amphistegina lessonii d'Orb.	×	×			×	×	×		×	
Operculina complanata Defr.				×						
,, sp.	×	×								
Heterostegina depressa d'Orb.					×			×	×	
,, sp.							×			
Linderina cf. *brugesi* Schlum.		×								
Lepidocyclina angularis New. & Holl.	×			×						
,, *andrewsiana* Jones & Chapm.	×			? ×						
,, ? *sumatrensis* Brady		×								
,, *munieri* Lemoine & Douville				×						
,, *verbeeki* Newton & Holland	×	? ×		×						

v. Notes on the New Species and more Remarkable Forms.

Trillina howchini Schlumberger. (Plate xxxix., figs. 7-9).

Trillina howchini Schlumberger, 1893, Bull. Soc. Géol. France, ser. 3, Vol. xxi. p. 119, woodcut fig. 1, and pl. iii. fig. 6.

The interesting genus *Trillina* contains only one species so far as known, which was first described in detail by M. Schlumberger under the name of *T. howchini*. It was previously discovered by the Rev. W. Howchin, who had identified it with *Quinqueloculina prisca* Terquem.* The specimens were originally found by Mr. Howchin in the lower beds† of Muddy Creek, near Hamilton, Victoria; they are there "moderately common." The same species has been recorded by Schlumberger as occurring very commonly in the Isle of Zebu in the East Indian Archipelago,‡ together with a species of *Sigmoïlina*. It is noteworthy that the latter genus is similarly present in association with *Trillina* in one of the limestones from Malekula.

Trillina howchini occurs only in one sample of limestone in our series, namely that from Bartaleppe, Malekula (No. 105). It is an abundant form, and easily recognisable in thin sections of the rock. Although isolated specimens were not obtained, the characters of the variously orientated sections of the tests are in every way identifiable with the clearly described and illustrated species established by Schlumberger. Both the megalospheric and microspheric forms appear to be here represented. The associated genera in this limestone are *Spiroloculina*, *Miliolina*, *Sigmoïlina*, *Alveolina*, *Truncatulina*, *Carpenteria*, *Gypsina*, *Miogypsina*, *Operculina*, and *Lepidocyclina*.

Alveolina cucumoides, sp.nov. (Plate xxxviii., figs. 5-6).

Alveolina sp. Verbeek, 1896, Descr. Géologique de Java et Madoura, Vol.i. p.1142, pl.ii. fig.43.

Description.—Test elongately fusiform; thickest in the middle, more or less constricted on either side, and tapering to a blunt point at either end. The convolutions number 8 or 9 in the adult shells. Chambers ovoid, the outer roof slightly arched.

* Trans. Roy. Soc. S. Australia, Vol.xii. 1889, p.2.

† Not the upper beds, as stated by Schlumberger, *loc. cit.* p.120.

‡ *Loc. cit.* p.123.

All the specimens, so far as seen, commence with a small initial chamber (*i.e.*, they are microspheric). Length of a typical specimen 2 mm.; thickness at centre 0·72 mm. Another example measures 1 mm. in diameter.

Occurrence.—Very abundant in limestone from Bartaleppe, Malekula (No. 108).

Observations.—There is little or no doubt that Verbeek's *Alveolina*, which he found in the Lower Miocene limestone in the Palabouhan District of Java, is the same as our species from Malekula which I now name *A. cucumoides*. Verbeek gives as the dimensions of the Javan examples, length 3·50 mm., thickness 0·75 mm., and the number of spiral turns as 6 to 7. He also states that the central chamber was not clearly seen in his preparations.

The above species differs markedly from *Alveolina elongata* d'Orbigny (= *A. frumentiformis* Schwager),* a species from the Middle and Upper Eocene, in its irregular contour, since it is not evenly cylindrico-fusiform as in Schwager's species, but is constricted on either side of the median axis; otherwise the shape and disposition of the chambers, and the structure of the test are very similar. It is especially interesting to meet with *Alveolina* in its microspheric stage, since all recorded recent forms have hitherto only been represented by the megalospheric type of shell. Schlumberger gives a single instance,† discovered by Munier-Chalmas, in which the microspheric form occurred in a fossil species. With regard to a recent species of the genus, *Alveolina boscii* Defr., I have lately met with some examples which also show this unusual condition. They are from the Great Barrier Reef of Queensland, in material obtained through the courtesy of Messrs. C. Hedley and J. Gabriel. The specimens are, however, very rare compared with the associated megalospheric form.

* Palæontographica, Vol. xxx. 1883, p. 100, pl. xxv., figs. 4*a-i*.

† Assoc. Franç. Avan. Sci., Congrès de Rouen, 1883, p. 526.

Polytrema planum Carter. (Plate xl., fig.11).

This encrusting foraminifer, so common as a reef-former at the present day, has already occurred in the fossil condition in the Miocene limestones of Wai Malikoliko and Wai Bubo, Santo, New Hebrides.* It now occurs in the Miocene limestone at Laleppe, Malekula, associated in its characteristic way of laminar intergrowth with a calcareous alga; and also in the Post-Miocene limestone of Port Stanley, Malekula, where it also played an important part in building up the rock.

Linderina cf. brugesi Schlumberger.

Linderina brugesi Schlumberger, 1893, Bull. Soc. Géol. France, ser.3, Vol.xxi. pl.iii. fig.9.

Our specimens occur in the friable limestone from Bartaleppe, Malekula, and there is very little doubt that they belong to Schlumberger's species. In median section *Linderina* can be separated from *Gypsina* by the continuous nature of the chamberlet-wall in the former, whereas in the latter the cells are entirely cut off from one another, excepting for the mural perforations.

A species of *Linderina* from the Miocene limestone of Borneo has already been recorded and figured by Newton & Holland,† and a more doubtful occurrence of the genus was noted from Riū-Kiū Island by the same authors.‡ Schlumberger's origina specimen of *L. brugesi* came from the Upper Eocene of Bruges, Gironde.

Lepidocyclina angularis Newton & Holland. (Plate xxxviii., fig.3).

L. angularis Newton & Holland, 1902, Journ. Coll. Sci. Tokyo, Vol.xvii. Art.6, p.10, pl.i. figs.1-6; pl.iii. fig.7.

This species is characterised by its depressed central area, the outer boundary of which is marked by strong calcified pillars,

* Proc. Linn. Soc. N. S. Wales, 1905, p.270, pl.v., fig.2.
† Ann. Mag. Nat. Hist. Ser.vii. Vol.iii. 1899, p.262, pl.x., fig.6.
‡ Journ. Coll. Sci. Tokyo, Vol.xvii. Art.6, 1902, p.15, pl.i., fig.2.

which emerge at the surface in large rounded bosses. Another feature of this species is the expansion of the median layer towards the edge of the test. Previously described only from Iriomoté Island, Riū-Kiū (Loo Choo Islands).

We have a fine series of this interesting *Lepidocyclina* in the sections of the Malekula Miocene limestones. It occurs both at Laleppe and Bartaleppe.

Lepidocyclina munieri Lemoine & R. Douvillé. (Pl.xxxvii.,fig.2).

L. munieri Lemoine & R. Douvillé, 1904, Mem. Soc. Géol. France, p.20, pl.ii. fig.22.

This species has been previously described by the above-named authors, from the upper part of the Aquitanian of the I. di Malo (Vicentin). As Lemoine and Douvillé have already pointed out, it may be readily distinguished from *L. angularis* by its external form; otherwise in certain respects they seem to be allied.

L. munieri occurred in the Malekula limestone at Bartaleppe.

Lepidocyclina andrewsiana Jones & Chapman. (Pl. xxxix., fig.10).

Prof. Silvestri in writing recently upon the variant forms of the type *Lepidocyclina dilatata* Michelotti sp.* has included the above species in the synonymy of Lemoine and Douvillé's *L. tournoueri*.† Should the two forms be proved identical, the earlier name *L. andrewsiana* is the one to retain. For the present, however, I am content to regard the two forms as distinct, since *L. andrewsiana* possesses very solid divergent pillars seen in vertical section, whilst the entire structure of the shell is more compactly built than in *L. tournoueri*. In the latter, moreover, the swollen central area is less pronounced and more irregular in contour, *L. andrewsiana* being practically sub-

* Atti Pont. Accad. Rom. Nuovi Lincei, Anno lix. 1906, p.148.

† Mem. Soc. Géol. France, No.32, 1904, p.19, pl.i. fig.5; pl.ii. figs.2, 14; pl.iii. fig.1.

spherical inside the flange, and this feature is constant in all the specimens I have seen.

vi. Summary of Results.

The present study of the Malekula foraminiferal rocks has brought to light some interesting facts in distribution. Chief among these are :—

(1) The occurrence of *Trillina* in the New Hebrides, a genus already proved to exist in southern Australia and the Philippines, which thereby seems to connect up the southern coast of Australia with the outlying islands of eastern Australasia and certain portions of the East Indian Archipelago, along which line in Oligocene and Miocene times there probably existed a shallow-water area where such littoral forms could flourish.

(2) The new species of *Alveolina* found in the Malekula limestone, although not previously described, had already been figured from Javan Miocene limestones, and thus a relationship is shown with the latter rocks.

(3) By the discovery of *Lepidocyclina angularis* at Malekula, already known from Miocene limestone in the Loo-Choo Islands, off Japan, there is shown a further extension of the Miocene shore-line as far north as Japan.

(4) The two species of *Miogypsina*, *M. burdigalensis* and *M. complanata*, are here found in rocks at about the same horizon, although they are not actually associated in the same limestone specimen, as was the case at Santo.* Thus the present occurrence affords additional evidence of the contemporaneity of the two species which elsewhere indicate strata of different ages. Samples 105 and 108 have three species of *Lepidocyclina* in common, which supports the idea of their belonging to the same zone.

(5) *L. munieri* has already occurred at Vicentin in Europe, in the Upper series of beds of Aquitanian age.

(6) *L. verbeeki* is perhaps one of the most widely distributed of the Miocene forms of the *Orbitoidinæ*, since Newton & Holland

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* Proc. Linn. Soc. N. S. Wales, 1905, Vol. xxx., p. 273.

record it from Borneo and the Loo Choo Islands, whilst Prof. Rupert Jones and the author identified it in the Miocene limestones of Christmas Island. Verbeek had it from Java, and it is recorded with some reservation by Lemoine & R. Douvillé from certain rocks in Spain.

(7) Evidence of oscillation of the Miocene shore-line in the neighbourhood of the New Hebrides is afforded by the occurrence of beds largely composed of *Globigerinæ* mixed with fine tuffaceous material, in close association with the limestones containing shallow-water reef-forming organisms, but itself must have been formed at some considerable depth, as shown by the vast accumulation of the pelagic globigerine shells.

(8) The two important reef-building agents of foraminiferal origin at the present day, namely *Carpenteria rhaphidodendron* and *Polytrema planum*, are here shown to have undoubtedly performed similar work in Miocene times.

(9) The Miocene genus *Linderina*, by its present occurrence, has its range extended farther eastward.

EXPLANATION OF PLATES.

Plate xxxvii.

Fig. 1.—*Operculina complanata* Defr. From the older limestone, Malekula; spec. No. 108 (× 14).

Fig. 2.—*Lepidocyclina munieri* Lemoine & R. Douvillé, *L. angularis* Newt. & Holl., and *Operculina complanata* Defr. From the older limestone, Malekula; spec. No. 108 (× 14).

Plate xxxviii.

Fig. 3.—*Lepidocyclina angularis* Newt. & Holl., and *Operculina complanata* Defr. Vertical sections. Malekula; spec. No. 108 (× 14).

Fig. 4.—*L. angularis* Newt. & Holl. Horizontal and median section. Malekula; spec. No. 108 (× 14).

Fig. 5.—*Alveolina cucumoides*, sp. nov. Median section. Malekula; spec. No. 108 (× 28).

Fig. 6.—*A. cucumoides*, sp. nov. Longitudinal section. Malekula; spec. No. 108 (× 28).

Plate xxxix.

Fig.7.—*Trillina howchini* Schlumberger. Longitudinal section. Malekula; spec. No.108 (×28).

Figs.8 and 9.—*T. howchini* Schlum. Transverse sections. Malekula; spec. No.108 (×28).

Fig.10.— *Lepidocyclina andrewsiana* Jones & Chapman. Vertical section. From the older limestone, Malekula: spec. No.105 (×14).

Plate xl.

Fig.11.—*Polytrema planum* Carter. From limestone probably of Post-Miocene age. Port Stanley; spec. No.87 (×36).

Fig.12.—Cavernous and granular limestone with encrusting calcareous algæ of (?) Post-Miocene age. Port Stanley; spec. No.88 (×28).

Plate xli.

Fig.13.—(?) Post-Miocene limestone showing *Amphistegina lessonii* d'Orb., *Orbulina universa* d'Orb., *Pulvinulina* sp., and a section of an echinoid spine. Laleppe, Malekula; spec. No.102 (×36).

Fig.14.—Post-Miocene limestone from E. Coast, Malekula, spec. No.91A. Showing *Sphæroidina dehiscens* P. & J. (×36).

Fig.15.—Post-Miocene limestone from E. Coast, Malekula; spec. No.91B. Showing abundant *Halimeda* and a vertical section of *Textularia trochus* d'Orb. (×14).